

Application No. 09/331,723  
Response filed on December 14, 2001  
Art Unit 1638

VERSION WITH MARKINGS TO SHOW CHANGES MADE

**IN THE CLAIMS:**

The claims have been amended as follows:

1. (Amended) A method of conferring resistance to protoporphyrinogen oxidase-inhibiting herbicides upon plants or plant cells, comprising introducing a DNA fragment[, or a biologically functional equivalent thereof,] or a plasmid containing the DNA fragment [or its biological functional equivalent] into plants or plant cells, wherein said DNA fragment [or said biologically functional equivalent] is expressed and has the following characteristics:

(1) said DNA fragment encodes a protein or a part of the protein [having], wherein said protein has protoporphyrinogen oxidase activity in plants;

[(2) said DNA fragment is homologous to a nucleic acid encoding an amino acid sequence selected from the group consisting of SEQ. ID. NO.:1, SEQ. ID. NO.:2 or SEQ. ID. NO.:3; encodes a protein or a part of a protein in which an amino acid corresponding to Val113 of SEQ. ID. No.:1 or SEQ. ID. No.:2 or SEQ. ID. No.:3 is substituted by another amino acid; that can be detected and isolated by DNA-DNA or DNA-RNA hybridization methods; and]

(2) said DNA fragment has a sequence that can be detected and isolated by DNA-DNA or DNA-RNA hybridization to a nucleic acid sequence encoding an amino acid sequence selected from the group consisting of

SEQ. ID. NO.:1, SEQ. ID. NO.:2 and SEQ. ID. NO.:3, wherein said DNA-DNA or DNA-RNA hybridization occurs under 2X PIPES buffer, 50% deionized formamide, 0.5% (w/v) SDS, 500µg/ml denatured sonicated salmon sperm DNA at 42°C overnight; and said DNA fragment remains hybridized after washing in 2X SSC, 1% (w/v) SDS;

(3) said DNA fragment encodes the protein or a part of the protein in which an amino acid corresponding to Val113 of SEQ. ID. NO.:1, or SEQ. ID. NO.:2 or SEQ. ID. NO.:3 is substituted by another amino acid; and

[(3)] (4) said DNA fragment has an ability to confer resistance to protoporphyrinogen oxidase-inhibiting herbicides in plant or algal cells when expressed therein.

2. (Amended) The method according to claim 1, wherein the DNA fragment [or biologically functional equivalent thereof,] or a plasmid containing the DNA fragment encodes a protein or a part of the protein, wherein said protein has [having] protoporphyrinogen oxidase activity in a dicot.

4. (Amended) The method according to claim 1, wherein the DNA fragment encodes a protein or a part of the protein, wherein said protein has [having] protoporphyrinogen oxidase activity in a monocot.

6. (Amended) The method according to claim 1, wherein the DNA fragment encodes a protein or a part of the protein, wherein said protein has [having] protoporphyrinogen oxidase activity in Chlamydomonas, and the DNA fragment encodes [a protein in which Val13 of SEQ. ID. NO.:1 is replaced by another amino acid] the protein or the part of the protein in which an amino acid corresponding to Val13 of SEQ. ID. NO.:1 is substituted by another amino acid.

8. (Amended) The method according to any one of claims 1 to 6, wherein the plant or plant cells upon which resistance is conferred is the green alga Chlamydomonas.

15. (Amended) [A] An isolated DNA fragment [or its biologically functional equivalent thereof] which has the following characteristics:

(1) said DNA fragment encodes a protein or a part of the protein [having], wherein said protein has protoporphyrinogen oxidase activity in plants;

(2) said DNA fragment has a sequence that can be detected and isolated by DNA-DNA or DNA-RNA hybridization to [a nucleic acid sequence homologous to] a nucleic acid sequence encoding an amino acid sequence selected from the group consisting of SEQ. ID. NO.:1, SEQ. ID. NO.:2 and SEQ. ID. NO.:3, wherein said DNA-DNA or DNA-RNA hybridization occurs under 2X PIPES buffer, 50% deionized formamide, 0.5% (w/v) SDS, 500µg/ml

**Application No. 09/331,723**  
**Response filed on December 14, 2001**  
**Art Unit 1638**

denatured sonicated salmon sperm DNA at 42°C overnight; and said DNA fragment or its complement remains hybridized after washing in 2X SSC, 1% (w/v) SDS;

(3) said DNA fragment encodes [a] the protein or the part of said protein in which an amino acid corresponding to Val13 of SEQ. ID. [No.]NO.:1 or SEQ. ID. [No.]NO.:2 or SEQ. ID. [No.]NO.:3 is substituted by another amino acid; and

(4) said DNA fragment has an ability to confer resistance to protoporphyrinogen oxidase-inhibiting herbicides in plant or algal cells when expressed therein.

16. (Amended) The DNA fragment [or biologically functional equivalent thereof] according to claim 15, wherein the DNA fragment encodes a protein or a part of the protein, wherein said protein has [having] protoporphyrinogen oxidase activity in a dicot.

18. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to claim 15, wherein the plant is a monocot.

20. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to claim 15, wherein the plant is the green alga *Chlamydomonas* and the DNA fragment encodes an amino acid

sequence resulting from replacement of Val13 of SEQ. ID. NO.: 1 by another amino acid.

21. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to any of claims 15 to 20, wherein said another amino acid is methionine.

22. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to claim 20, wherein the DNA fragment has a sequence that can be isolated from genomic DNA of *Chlamydomonas* [and], the DNA fragment encodes a protein or a part of the protein, wherein the protein has [having] protoporphyrinogen oxidase activity, and a nucleotide corresponding to guanine at position 37 (G37) of SEQ. ID. NO.:4 replaced with another nucleotide.

23. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to claim 22, wherein said another nucleotide is adenine.

24. (Twice Amended) A plasmid comprising the DNA fragment [or biologically functional equivalent thereof] described in claim 15.

Claims 41 and 42 have been added.